AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions of claims in the application.

LISTING OF CLAIMS:

Claims 1-19: (Cancelled).

[Claim 20] (previously presented): A photonic waveguide comprising of:

a substrate,

a first layer of a nanomaterial,

a second layer of a nanomaterial,

a third layer of the first nanomaterial,

a fourth layer of an optical material,

wherein the second layer has a higher refractive index than the first layer,

wherein the third layer has the same refractive index as the first layer,

wherein the first layer is the bottom cladding,

wherein the second layer is the guiding layer,

wherein the third layer is the top cladding,

wherein the fourth layer is a cover layer,

wherein the second layer is patterned to form the core of the waveguide,

wherein the first and the third layers enclose the second layer, thus forming a waveguide,

wherein the waveguiding is accomplished by the natural index contrast (NIC) principle where the NIC value is given by

$$\Delta n = \frac{n_2 - n_1}{n_1} \times 100 ,$$

where n_1 and n_2 are as defined in the text.

[Claim 21] (Previously presented): The waveguide of claim 20 wherein the waveguide can transmit light at least in the wavelength range of 1060 to 1650 nm.

[Claim 22] (Previously presented): The waveguide of claim 20 wherein the first layer comprises of a nanomaterial that is deposited on the said substrate by at least one method from spin-coating, spray deposition, chemical vapor deposition, etc.

[Claim 23] (Previously presented): The waveguide of claim 20 wherein the second layer comprises of a nanomaterial that is deposited on top of the said first layer of Claim 22 by at least one method from spin-coating, spray deposition, chemical vapor deposition, etc.

[Claim 24] (Previously presented): The waveguide of claim 20 wherein the first layer is at least a dendrimer, a spin-on-glass, a nanosilica, a polymer, or a composition thereof.

[Claim 25] (Previously presented): The waveguide of claim 20 wherein the second layer is at least a dendrimer, a spin-on-glass, nanosilica, a polymer, or a composition thereof.

[Claim 26] (Previously presented): The waveguide of claim 20 wherein the thickness of the first layer is controlled at least by solution concentration, solution viscosity, solution pH, spin-coating parameters, and curing parameters.

[Claim 27] (Previously presented): The waveguide of claim 20 wherein the thickness of the second layer is controlled at least by solution concentration, solution viscosity, solution pH, spin-coating parameters, and curing parameters.

[Claim 28] (Previously presented): The waveguide of claim 20 wherein the patterned second layer comprises of a plurality of waveguides.

[Claim 29] (Previously presented): The waveguide of claim 20 wherein the second layer is comprised of at least one waveguide structure from a group of

waveguide structures comprising of: linear waveguide, curved waveguide, circular waveguide, splitter, spiral waveguide, serpentine waveguide, branched waveguide, slab waveguide, parallel waveguide, converging waveguide, diverging waveguide, and interconnect waveguide.

[Claim 30] (Previously presented): The waveguide of claim 20 wherein the patterned second layer defines at least one device.

[Claim 31] (Previously presented): The waveguide of claim 20 wherein the substrate material comprises of at least one hard and non-flexible material from the group: silicon, glass, quartz, plastic, alumina, and ceramic.

[Claim 32] (Previously presented): The waveguide of claim 20 wherein the substrate material comprises of at least one soft and flexible material from the group: plastic, polyimide, pyrex, and polymer.

[Claim 33] (Previously presented): A photonic waveguide comprising of:

a substrate,

a first layer of a nanomaterial,

a second layer of a nanomaterial,

a third layer of the first nanomaterial,

a fourth layer of an optical material,

wherein the second layer having the ability to amplify an optical signal,

wherein the second layer has a higher refractive index than the first layer,

wherein the third layer has the same refractive index as the first layer,

wherein the first layer is the bottom cladding,

wherein the third layer is the top cladding,

wherein the first and the third layers enclose the second layer, thus forming a waveguide,

wherein the second layer is an amplifying layer,

wherein the second layer is patterned to form the waveguide core, and pumped by a pump laser,

wherein the waveguide can amplify light at least in the wavelength range of 1060 to 1650 nm,

wherein the amplification wavelength range is tuned by choosing at least one rare-earth dopant species,

wherein the amplification efficiency is tuned at least by the concentration of the rare-earth metal ion incorporation in the second layer.

[Claim 34] (Previously presented): The waveguide of claim 33 wherein the pump and the signal are combined via a coupler.

[Claim 35] (Previously presented): The waveguide of claim 33 wherein the first layer is at least a dendrimer, spin-on-glass, nanosilica, polymer, or a composition thereof.

[Claim 36] (Previously presented): The waveguide of claim 33 wherein the second layer is at least a dendrimer, a spin-on-glass, a nanosilica, a polymer, or a composition thereof.

[Claim 37] (Previously presented): The waveguide of claim 33 wherein the second layer is incorporated with at least one rare-earth metal ion from a group comprising of: Erbium, Neodymium, Praseodymium, Thorium, Holmium, Terbium, Europium, and other rare-earth metal ions with a dendrimer.

[Claim 38] (Previously presented): The waveguide of claim 33 wherein the patterned second layer comprises of a plurality of waveguides.

[Claim 39] (Previously presented): The waveguide of claim 33 wherein the second layer is comprised of at least one waveguide structure from a group of waveguide structures comprising of: linear waveguide, curved waveguide, circular waveguide, splitters, spiral waveguide, serpentine waveguide, branched waveguide, slab waveguide, parallel waveguide, converging waveguide, diverging waveguide, and interconnect waveguide.

[Claim 40] (Previously presented): The waveguide of claim 33 wherein the patterned second layer defines at least one device.

[Claim 41] (Previously presented): The waveguide of claim 33 wherein the substrate material comprises of at least one hard and non-flexible material from the group: silicon, glass, quartz, plastic, alumina and ceramic.

[Claim 42] (Previously presented): The waveguide of claim 33 wherein the substrate material comprises of at least one soft and flexible material from the group: plastic, polyimide, pyrex, and polymer.

[Claim 43] (Previously presented): A photonic waveguide comprising of:

a substrate,

a first layer of a nanomaterial,

a second layer of a nanomaterial,

a third layer of the first nanomaterial,

a fourth layer of an optical material,

wherein the second layer having the ability to modulate an optical signal via increased electro-optic coefficient,

wherein the second layer has a higher refractive index than the first layer,

wherein the third layer has the same refractive index as the first layer,

wherein the first layer is the bottom cladding,

wherein the third layer is the top cladding,

wherein the first and the third layers enclose the second layer, thus forming a waveguide,

wherein the second layer is patterned to form the core of the waveguide,

wherein the second layer is a modulating layer,

wherein the waveguide can modulate light at least in the wavelength range of 1060 to 1650 nm.

[Claim 44] (Previously presented): The waveguide of claim 43 wherein the first layer is at least a dendrimer, a spin-on-glass, a nanosilica, a polymer, or a composition thereof.

[Claim 45] (Previously presented): The waveguide of claim 43 wherein the second layer is at least a dendrimer, a spin-on-glass, a nanosilica, a polymer, or a composition thereof.

[Claim 46] (Previously presented): The waveguide of claim 43 wherein the second layer is doped with at least one inorganic additive.

[Claim 47] (Previously presented): The waveguide of claim 43 wherein the second layer is doped with at least one organic additive such as a chromophore.

[Claim 48] (Previously presented): The waveguide of claim 43 wherein the patterned second layer comprises of a plurality of waveguides.

[Claim 49] (Previously presented): The waveguide of claim 43 wherein the second layer is comprised of at least one waveguide structure from a group of waveguide structures comprising of: linear waveguide, curved waveguide, circular waveguide, splitters, spiral waveguide, serpentine waveguide, branched waveguide, slab waveguide, parallel waveguide, converging waveguide, diverging waveguide, and interconnect waveguide.

[Claim 50] (Previously presented): The waveguide of claim 43 wherein the patterned second layer defines at least one device.

[Claim 51] (Previously presented): The waveguide of claim 43 wherein the substrate material comprises of at least one hard and non-flexible material from the group: silicon, glass, quartz, plastic, alumina and ceramic.

[Claim 52] (Previously presented): The waveguide of claim 43 wherein the substrate material comprises of at least one soft and flexible material from the group: plastic, polyimide, pyrex, and polymer.

[Claim 53] (New): The waveguide of claim 20 wherein the guiding layer has the ability to amplify an optical signal.

[Claim 54] (New): The waveguide of claim 53 wherein the second layer is pumped by a pump laser.

[Claim 55] (New): The waveguide of claim 54 wherein the second layer can amplify light at least in the wavelength range of 1280 nm to 1650 nm.

[Claim 56] (New): The waveguide of claim 55 wherein at least one or more dopant is present from the group of dopants comprised of Erbium, Ytterbium, Neodymium, Praseodymium, Thorium, Holmium, Terbium, Europium, and other rare-earth metal ions with a dendrimer.

[Claim 57] (New): The waveguide of claim 56 wherein amplification efficiency is controlled by the doping concentration, power of a single pump laser, and power of two simultaneous pump lasers.

[Claim 58] (New): The waveguide of claim 20 wherein the guiding layer is also an amplifying layer.

[Claim 59] (New): The waveguide of claim 20 wherein the guiding layer has the ability to modulate an optical signal.

[Claim 60] (New): The waveguide of claim 20 wherein the guiding layer is also a modulating layer.

[Claim 61] (New): The waveguide of claim 20 wherein the guiding layer is doped to amplify an optical signal.

[Claim 62] (New): The waveguide of claim 20 wherein the guiding layer is doped to modulate an optical signal.

[Claim 63] (new): A photonic integrated circuit, comprising:

a first layer of nanomaterial with a first refractive index;

a second layer of nanomaterial with a second refractive index, wherein the second refractive index is greater than the first refractive index; and

a third layer of nanomaterial with a third refractive index, wherein the third refractive index is substantially the same as the first refractive index.

[Claim 64] (New): The photonic integrated circuit of claim 63, wherein the second layer is a guiding layer.

[Claim 65] (New): The photonic integrated circuit of claim 64, wherein the guiding layer is doped for signal amplification.

[Claim 66] (New): The photonic integrated circuit of claim 64, wherein the guiding layer is doped for signal modulation.

[Claim 67] (New): The photonic integrated circuit of claim 64, wherein the guiding layer has a dopant.